

ST. JOSEPH COLLEGE OF ENGINEERING
Department of Electrical and Electronics Engineering
SUBJECT CODE: EE6502

SUBJECT NAME: Microprocessor and Microcontroller

Regulation: 2013 Year and Semester: III /V

UNIT-I 8085 MICROPROCESSOR
PART - A

1. What is stack and what is the use of stack pointer?

The stack is a reserved area of the memory in the RAM where temporary information may be stored. A 16-bit stack pointer is used to hold the address of the most recent stack entry.

2. Mention the use of ALE.

(Dec-2015, Dec-2013, May-2010)

The ALE signal is used to demultiplex (separate) AD0 – AD7 lines to A0 – A7 (address lines) and D0 – D7 (data lines). The separation of address lines and data lines is achieved by connecting an external latch to AD0 – AD7 lines and enabling the latch when signal is active.

3. State the functions of keyboard interrupts

Keyboard interrupt is a special case of signal usually generated by the keyboard in the text user interface. This signal is used to generate a hardware interrupt when a key is pressed or released.

4. List the 8085 flags.

(Dec-2014, Dec-2013)

Various flags are :

S (Sign flag), Z (Zero flag), AC (Auxiliary carry flag), P (Parity flag), CY (Carry flag).

5. What is meant by level-triggered interrupt? Which of the interrupts in 8085 are level triggered?

A level triggered interrupt is an interrupt signaled by maintaining the interrupt line at a high or low level. A device wishing to signal a level triggered interrupt drives the interrupt request line to its active level (high or low), and then holds it at that level until it is recognized by microprocessor. In 8085 microprocessor,

6. What is the function of program counter in 8085 microprocessor? (May-2013)

Program counter stores the address of the next instruction to be fetched. Thus it is used as pointer to the instruction.

7. What is trap interrupt and its significance?

This interrupt is a non-maskable interrupt. It is unaffected by any mask or interrupt enable. TRAP has the highest priority. TRAP interrupt is edge and level triggered. This means that the TRAP must go high and remain high until it is acknowledged. This avoids false triggering caused by noise and transients.

8. List the control and status signals of 8085 and mention its need. (Dec-2012)

\overline{ALE} (Address Latch Enable)

\overline{RD} and \overline{WR} (Read and Write)

IO/\overline{M} , S_0 S_1 , READY

Parity flag – Parity is defined by the number of one's present in the accumulator. After an arithmetic or logical operation if the result has an even number of ones, i.e., even parity, the flag is set. If the parity is odd, flag is reset.

Zero flag – the zero flag sets if the result of operation in ALU is zero and flag resets if result is non zero. The zero flag is also set if a certain register content becomes zero following an increment or decrement operation of that register.

9. To obtain a 320 ns clock, what should be the input clock frequency? What is the frequency of clock signal at CLK OUT?

$$\text{System clock frequency} = 1/T = 1 / 320 \times 10^{-9} = 3.125 \text{ MHz}$$

$$\text{Crystal clock frequency} = 2 * \text{System clock frequency}$$

$$= 2 * 3.125 * 10^6$$

$$= 6.25 \text{ MHz}$$

$$\text{The frequency of clock signal at CLK OUT} = \text{Crystal frequency}/2$$

$$= 6.25/2$$

$$= 3.125 \text{ MHz.}$$

10. List the five interrupts pins available in the 8085

(May-010)

The five interrupt pins are

TRAP, RST 7.5, RST 6.5, RST 5.5, INTR.

11. Specify the size of data, address, and memory word and memory capacity of 8085 microprocessor.

Size of data bus = 8-bits Size of memory word = 8-bits

Size of address bus = 16-bits Memory capacity = 64 Kbytes

12. What is interrupt? (May-2006, May-2009)

Interrupt is an external signal that causes a microprocessor to jump to a specific subroutine.

13. How performance of a microprocessor is measured in terms of MIPS?

The performance of a microprocessor is measured in terms of MIPS (Million instructions per Second). MIPS rate = $1/(\text{Average time required for the execution of instruction} * 10^6)$

14. What are the different machine cycles in 8085 microprocessor? (May-2008)

Opcode fetch, Memory read, Memory write, I/O read, I/O write, Interrupt acknowledge, Bus idle.

15. What is microprocessor? Give the power supply & clock frequency of 8085

A microprocessor is a multipurpose, programmable logic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to those instructions and provide result as output. The power supply of 8085 is +5V and clock frequency in 3MHz.

16. What is the function of IO/M signal in the 8085?

It is a status signal. It is used to differentiate between memory locations and I/O operations. When this signal is low (IO/M = 0) it denotes the memory related operations. When this signal is high (IO/M = 1) it denotes an I/O operation.

17. Mention the purpose of SID and SOD lines SID

(Serial input data line):

It is an input line through which the microprocessor accepts serial data.

SOD (Serial output data line):

It is an output line through which the microprocessor sends output serial data.

18. Explain the signals HOLD, READY and SID

HOLD indicates that a peripheral such as DMA controller is requesting the use of address bus, data bus and control bus. READY is used to delay the microprocessor read or write cycles until a slow responding peripheral is ready to send or accept data. SID is used to accept serial data bit by bit

19. What is meant by Wait State?

This state is used by slow peripheral devices. The peripheral devices can transfer the data to or from the microprocessor by using READY input line. The microprocessor remains in wait state as long as READY line is low. During the wait state, the contents of the address, address/data and control buses are held constant.

20. What is the signal classification of 8085

All the signals of 8085 can be classified into 6 groups

- Address bus
- Data bus
- Control and status signals
- Power supply and frequency signals
- Externally initiated signals
- Serial I/O ports

PART –B

1. Draw the pin configuration of 8085 and explain the purpose of each signal. **(16)**
2. Deduce the functional description of 8085 Microprocessor with neat diagram. **(16)**
3. Describe the hardware architecture of 8085 microprocessor with a neat block diagram. **(16)**
4. Draw the timing diagram of Opcode fetch machine cycle and explain. **(8)**
5. Draw and explain the timing diagram of memory write operation. **(8)**
6. Describe in detail about memory interfacing using 8085. **(8)**
7. Draw and explain the flag register of 8085 in brief. **(8)**

8. Draw the timing diagram for memory read cycle and explain. **(8)**
9. Draw and explain the timing diagram for MVI A,32H. **(8)**
10. Illustrate the execution of instruction CALL 4322H with timing diagram. Assume the relevant details. **(8)**
11. Illustrate about the bus structure of 8085 processor. **(8)**
12. Design an interface circuit for microprocessor controlled system to meet the following specifications. (a) 74LS138: 3to 8 decoder. (b) 2732 (4K x 8): **(16)**
EPROM- address range should begin at 0000h and additional 4K memory space should be available for future expansion.
(c)6116 (2K x 8): CMOS R/W memory
13. Discuss with flow diagram how an instruction is fetched and executed in an 8085 processor. **(16)**
14. Discuss in detail about the I/O read and write operation of 8085 processor with timing diagram. **(8)**
15. Discuss briefly the input and output interfacing techniques used in 8085 microprocessor. **(8)**
16. Explain an 8085 interrupt process and mention the difference between a maskable and a non maskable interrupts. **(16)**
17. Draw and explain the timing diagram for SHLD 16-bit address. **(8)**
18. Explain the interpretation of the accumulator bit pattern for SIM and RIM instruction. **(8)**
19. What are the data transfer mechanism supported by 8085 processor? **(8)**
20. Write short notes on RST (RESTART) instructions. **(8)**
21. Two machine codes 3EH and 32H are stored in memory locations 2000H and 2001H respectively. The first machine code 3EH represents the opcode to load a data byte in the accumulator and the second code 32H represents the data byte to be loaded in the accumulator. Illustrate and explain the bus timings of 8085 as these machine codes are executed. **(8)**

UNIT-II PROGRAMMING OF 8085 PROCESSOR

PART - A

1. What is indexing?

NOV/DEC 2012

Indexing technique allows programmer to point or refer the data stored in sequential memory locations one by one.

2. What are the various types of 8085 instructions? MAY/JUNE 2013, NOV/DEC 2011

1. Data transfer group – MOV A,B
2. Arithmetic group – ADD B
3. Logical group- ANA B
4. Branch group – JMP LABEL
5. Stack I/O and Machine Control group – PUSH,POP,HLT.

3. Explain the difference between a JMP instruction and CALL instruction.

MAY/JUNE 2012

A **JMP** instruction permanently changes the program counter.

A **CALL** instruction leaves information on the stack so that the original program execution sequence can be resumed.

4. What is meant by lookup table?

NOV/DEC 2014

A lookup table is an array that replaces runtime computation with a simpler array indexing operation. The savings in terms of processing time can be significant, since retrieving a value from memory is often faster than undergoing an expensive computation or input/output operation.

5. Explain the functioning of CMP instructions?

NOV/DEC 2015

This instruction subtracts the contents of the specified register from contents of the accumulator and sets the condition flags as a result of the subtraction.

6. Mention the similarity and difference between compare and subtract instructions.

May/June 2014

The compare and subtract instructions both are subtract one operand from another and sets the flag register accordingly. The subtract instruction stores the result in the accumulator while the compare instruction does not store any result except flags.

7. State the purpose and importance of NOP instruction.

May/June 2014

The NOP instruction in CPU's is to insert a time delay. It may be useful to force the CPU to wait for external (slower) devices to complete its work.

8. What are the different types of addressing modes? NOV/DEC 2013, MAY/JUNE 2012

The addressing modes specifies the location of the operand(data). The different types are as follows

1. Immediate addressing
2. Register addressing
3. Direct addressing
4. Indirect addressing
5. Implicit addressing

9. Define stack and stack related instructions? MAY/JUNE 2013, NOV/DEC 2012

The stack is a group of memory locations in the R/W memory that is used for the temporary storage of binary information during the execution of the program. The stack related instructions are PUSH and POP

10. State the function of given 8085 instructions: JP, JPE, JPO, JNZ

JP – Jump on positive	S=0
JPE- Jump on parity even	P=1
JPO- Jump on parity odd	P=0
JNZ-Jump if no zero	Z=0

11. What are subroutine?

Subroutine are group of instructions stored as a separate program in memory and it is called from the main program whenever required.

12. What is a recursive procedures?

A recursive procedure is a procedure, which calls itself. Recursive procedures are used to work with complex data structures called trees. If the procedure is called with N=3, then the N is decremented by 1 after each procedure CALL and the procedure is called until N=0.

13. How to access subroutine with in the main program procedure? NOV/DEC 2013

- i) Accessed by CALL & RET instruction
- ii) Machine code of instruction is put only once in the memory
- iii) With procedures less memory is required
- iv) Parameters can be passed in registers, memory location or stack

14. What are the four instructions which control the interrupt structure of the 8085 microprocessor?

- DI(disable interrupts)
- EI(enable interrupts)
- RIM(read interrupt masks)
- SIM(set interrupt masks)

15. How the microprocessor is synchronized with peripherals?

The timing and control unit synchronizes all the microprocessor operations with clock and generates control signals necessary for communication between the microprocessor and peripherals.

16. What are the functions of an accumulator?

The accumulator is the register associated with the ALU operations and sometimes I/O operations. It is an integral part of ALU. It holds one of data to be processed by ALU. It also temporarily stores the result of the operation performed by the ALU.

17. Explain the difference between a JMP instruction and CALL instruction.

A JMP instruction permanently changes the program counter. A CALL instruction leaves information on the stack so that the original program execution sequence can be resumed.

18. What is the difference between the shift and rotate instructions?

A rotate instruction is a closed loop instruction. That is, the data moved out at one end is put back in at the other end. The shift instruction loses the data that is moved out of the last bit locations.

19. Why do we use XRA A instruction

The XRA A instruction is used to clear the contents of the Accumulator and store the value 00H.

20. Write 8085 assembly language instructions to store the contents of the flag register in memory location 2000H.

```
PUSH PSW POP B
MOV A,C STA
2000H. HLT
```

21. What is program counter? How is it useful in program execution?

The program counter keeps track of program execution. To execute a program the starting address of the program is loaded in program counter. The PC sends out an address to fetch a byte of instruction from memory and increments its content automatically.

22. List some of the Logical instructions in 8085.

```
ANA R
ANI 8-bit
ANA M
ORA R
ORI 8-bit
ORA M
XRA R
XRI 8-bit
XRA M
```

PART-B

1. Describe with suitable example the instruction format and different addressing modes of 8085 processor. (16)
2. Explain the operations carried out when 8085 executes the instruction, (16)
(i) MOV A, M (ii) XCHG (iii) DAD B (iv) DAA
3. Describe with suitable examples the data transfer and control instructions in 8085 microprocessor (8)
4. Describe the categories of instructions used for data manipulation in 8085 μ p. (8)
5. Write short notes on branching operations available in 8085. (8)
6. Compare the similarities and differences of CALL and RET instructions with PUSH and POP instructions. (8)

7. Evaluate the contents of registers A, B, C and D and the flag status ie (S,Z and CY) as the following instructions are executed. **(8)**

A. MVI A,00H

B. MVI B, F8H

C. MOV C,A

D. MOV D,B

E. HLT

8. Explain the following instructions LXI, CMC, RLC, RAL. **(8)**

9. Illustrate a program with a flowchart to multiply two 8-bit numbers. **(8)**

10. Illustrate an 8085 ALP to count continuously in hexadecimal from FFH to 00H in a system with a 0.5 μ s clock period. Use register C to set up 1ms delay between each count and display the numbers. **(8)**

11. Write a program to obtain 1's complement of 16-bit number stored at location FC15(H) and FC16(H).Store the result at location FC17 (H) and FC18 (H).MSB should be in location FC16(H) and FC18(H). **(8)**

12. Develop an ALP to load the hexadecimal numbers 9BH and A7H in registers D and E respectively and add the numbers. If the sum is greater than FFH display 01H at output port 00H; Otherwise display the sum. **(8)**

13. Express a two digit BCD number stored in memory into hexadecimal number. Use the NEAR procedure call. **(16)**

14. Develop a program to transfer 50 bytes of data from memory location starting from 2000H to 3000H using the string instruction MOV S B. **(16)**

15. Assume the SP register contains 2099H, register B contains 32H and register C contains 57H. Write the instructions to save the contents of the BC register pair on the stack and specify the register contents (SP, B and C) after execution. **(8)**

16. Illustrate a program to find the two's complement of a 16 bit data with example. **(8)**

17. Write an ALP using 8085 instructions to implement a hexadecimal to 7-segment decoder using look-up table method. **(8)**

18. Write the 8085 ALP for modulo 10 counter with flowchart. **(8)**

19. Illustrate with a suitable 8085 assembly language program, the use of subroutine instructions. (8)
20. Develop an 8085 assembly language program to sort numbers in ascending order.
21. Develop an assembly language program based on 8085 microprocessor instruction set to search the smallest data in a set. (8)
22. Describe what is meant by counting, looping and indexing. (8)
23. Explain briefly about subroutine with example. (8)
24. Describe with suitable example the operation of stack. (8)

UNIT-III 8051 MICROCONTROLLER PART - A

1. What is Microcontroller?

A device which contains the microprocessor with integrated peripherals like memory, serial ports, parallel ports, timer/counter, interrupt controller, data acquisition interfaces like ADC, DAC is called microcontroller.

2. List the features of 8051 microcontroller.

(Nov/Dec 2014)

The features are single supply +5 volt operation using HMOS technology. 4096 bytes program memory on chip (not on 8031), 128 data memory on chip, Four register banks, Two multiple modes, 16-bit timer/counter, Extensive Boolean processing capabilities, 64 KB external RAM size

3. How is the Program memory organized in an 8051 Microcontroller?

In an 8051 based system the entire 64KB program memory can be external or 4 KB is internal and the remaining 60 KB is external. This is decided by the logic level of the signal \overline{EA} Pin. When \overline{EA} pin is tied high (+Vcc or 5 V) the first 4 KB of program memory is internal and the remaining 60 KB is external. When \overline{EA} pin is tied low (GND or 0 V) the internal ROM is ignored and the entire 64 KB is external.

4. List the alternative functions assigned to port 3 pins of 8051 microcontroller.

(May/June 2011)

Port pins	Alternative function
P3.0	Received Data
P3.1	Transmission Data
P3.2	INT0
P3.3	INT1
P3.4	T0
P3.5	T1
P3.6	WR
P3.7	RD

5. What is the role of DPTR in 8051 Microcontroller?

The Data Pointer (DPTR) is the 8051s only user-accessible 16-bit (2-byte) register. The Accumulator, "R" registers, and "B" register are all 1-byte values. DPTR, as the name suggests, is used to point to data. It is used by a number of commands which allow the 8051 to access external memory. When the 8051 accesses external memory it will access the external memory at the address indicated by DPTR. While DPTR is most often used to point to data in external memory, many programmers often take advantage of the fact that it's the only true 16-bit register available. It is often used to store 2-byte values which have nothing to do with memory locations

6. Mention the size of DPTR and stack pointer in 8051 microcontroller. The

DPTR is 16 bit data Register and SP is 8 bit Register.

7. What is the need of Coprocessor?

The general-purpose processors such as 8086 or 8085 are not optimized to do arithmetic manipulations, CRT display manipulation and word processing. Hence we go for a coprocessor, which is capable of doing dedicated functions (Special Operations) to increase the overall execution speed of larger systems.

8. Write the vector address and priority sequence of 8051 interrupts (Nov/Dec 2014)

	Vector
The interrupts are	: address
External interrupt 0	: IE0: 0003H
	TF0:
Timer interrupt 0	: 000BH
External interrupt 1	: IE1: 0013H
Timer Interrupt 1	: TF1:001BH
Serial Interrupt Receive interrupt	: RI: 0023H
Transmit interrupt	: TI: 0023H

9. What are the addressing modes of 8051 microcontroller? (Nov/Dec 2014)

The 8051 provides a total of five distinct addressing modes.

(1) Immediate (2) register (3) direct (4) register indirect (5) indexed

10. Mention the purpose of \overline{PSEN} and \overline{EA} in 8051 microcontroller. (May/June 2014)

\overline{PSEN} : If external ROM is used for storing program then a logic zero (0) appears on it every time the microcontroller reads a byte from memory.

\overline{EA} : By applying logic zero to this pin, P2 and P3 are used for data and address transmission with no regard to whether there is internal memory or not. It means that even there is a program written to the microcontroller, it will not be executed. Instead, the program written to external ROM will be executed. By applying logic one to the EA pin, the microcontroller will use both memories, first internal then external (if exists).

11. List the interrupt sources in 8051 microcontroller. (May/June 2014) (Nov/Dec 2015)

8051 Microcontroller has 5 interrupts: (1) External interrupt 0 (2) External interrupt 1 (3) Timer0 overflow (4) Timer1 overflow (5) Transmission interrupt (TI)/ reception interrupt (RI) (6) Reset.

12. What is the function of R registers in 8051 Microcontroller?

The R registers are in a group of register banks denoted as bank 0 to bank 3. The R registers of any bank can take value from 0 to 7. At any one time the controller can use any one of the register banks as general purpose registers. The selection of register banks depends on the value of the bits RS0 and RS1 in the PSW registers. After a reset the PSW register is cleared and so the controller works with register bank0.

13. Give the details of PSW of 8051.

(May/June 2010)

The PSW stores the status of the results of the ALU operations and some of the status of the processor by means of 1 bit status flags. The PSW is also known as flag register. The flags are useful for the programmer to test condition of the result and make decisions. The PSW consists of four math flags and two register bank select bits. The Math flag are carry, auxiliary carry, overflow and parity flag. The register bank select bits are RS0 and RS1.

14. Mention the registers used for serial communication in 8051 Microcontroller? (Nov/Dec 2014)

SCON- Serial port control register, SBUF- Serial port data buffer are the registers used for serial communication in 8051 Microcontrollers.

15. Explain relative addressing in an 8051.

In relative addressing, the instruction specifies the address relative to the PC(Program Counter). The instruction will carry an offset whose range is -12810 to +12710. The offset is added to the PC to generate the 16 bit physical address.

Example: JC offset- If carry is one, then the program control jumps to an address obtained by adding the content of the PC and the offset value in the saturation.

16. List the instructions that affect the overflow flag in 8051

ADD, ADDC, SUBB, DIV and MUL.

17. Define machine cycle of 8051.

8051 machine cycle consists of 6 states, S1 through S6. One state is made up of 2 clock pulses. Thus 12 clock periods constitute one machine cycle. Two clock periods in a state is termed as phase1 and phase2.

18. What are the alternate functions of port3 of 8051?

Serial data i/p(P3.0), serial data o/p(P3.1), external interrupt0(P3.2), external interrupt1(P3.3), external i/p for Timer0(P3.4), external i/p for Timer1(P3.5), external memory read(P3.7) are alternate functions of port3.

19. Mention the priority order of 8051 interrupts.

1. IE0(External Interrupt0)
2. TF0(Timer Interrupt0)
3. IE1(External Interrupt1)
4. TF1(Timer Interrupt1)
5. RI or TI(Serial port Interrupt)

20. What is the use of scratch pad area of internal RAM of 8051?

In internal RAM, 80 bytes constitute the scratch pad area. The scratch pad bytes can be programmed as a general purpose registers.

21. What is the significant of SFRs.

SFRs denotes Special Function Registers of 8051 controller. All the controller registers such as port latches, timer registers, peripheral control register, and accumulator. PC and DPTR all are available in SFR region.

PART-B

1. Describe with a neat block diagram the architecture of 8051 microcontroller. **(16)**
2. Explain in detail about the pin diagram of 8051 microcontroller. **(16)**
3. Name the register set of 8051 and also discuss how memory and I/O addressing is done in 8051.
 - a. Illustrate how to interface 8051 with RS232 connectors via the MAX 232 Chip with a neat diagram.
4. Elaborate the Boolean processing capabilities of a 8051 microcontroller.
 - a. Illustrate with block diagram how to access external memory devices in an 8051 based system.
5. Explain the I/O ports and their functions of 8051 microcontroller. **(8)**
6. Illustrate the different modes with which the timer/counter in 8051 can be programmed. **(8)**
7. Discuss the addressing modes of 8051 microcontroller with suitable examples. Describe in detail the different methods of memory address decoding in 8051. **(16)**
8. Describe the operation of stack in 8051. Describe briefly about interrupts used in 8051 microcontroller. **(16)**
9. Discuss in detail about the memory organization of 8051 microcontroller and explain.
10. Explain how internal timers are used to generate time delay by using 8051 microcontroller. **(16)**
11. Show how serial communication is performed in 8051 microcontroller. **(16)**
 - a. Explain the programming concepts of 8051 in comparison with 80805.
 - b. Describe in detail about the special function registers in 8051 microcontroller.

12. Design an 8051 based system with 16 K bytes of program ROM and 16 K bytes of data ROM. (16)
13. What are the functional blocks available in 8051? Explain with a block diagram. (16)

UNIT- IV PERIPHERAL INTERFACING

PART - A

1. Bring about the features of 8259. (May/June-2014)

It is a programmable interrupt controller. It manages eight interrupt requests. 2. The interrupt vector addresses are programmable. 3. The priorities of interrupts are programmable. 4. The interrupt can be masked or unmasked individually

2. How data is transmitted in asynchronous serial communication? (May/June-2014)

In asynchronous data transfer, one character is transferred at a time. Start and stop bits are used with each character. The transmitter and receiver use two separate clock inputs here.

3. What are the internal registers available in 8259 PIC? (Apr/May-2015)

Interrupt mask register (IMR), interrupt Request register (IRR), In service register (ISR) and Priority register (PR)

4. What are the functions of USART? (Nov/Dec-2014)

USART stands for universal Synchronous / Asynchronous Receiver / Transmitter. It is a programmable communication interface that can communicate by using either synchronous or asynchronous serial data.

5. What is scan counter in 8279? (Nov/Dec-2012)

The scan counter has two modes to scan the key matrix and refresh the display. In the encoded mode, the counter provides binary count that is to be externally decoded to provide the scan lines for keyboard and display. In the decoded scan mode, the counter internally decodes the least significant 2 bit and provides a decoded 1 out of 4 scan on SL3-SL 3. The keyboard and display both are in the same mode at a time.

6. What are the basic modes of operations of 8255?

(Nov/Dec-2013)

- a) I/O Mode i. Mode 0- Simple Input/ Output. ii. Mode 1- Strobe Input/ Output (handshake mode) iii. Mode 2- Strobe bi-directional mode b) Bit Set/Reset Mode.

7. List out the operating modes in 8253 Timer/Counter.

(Nov/Dec-2014)

Mode 0 : Interrupt on terminal count

MODE 1 : Hardware Retrigger able One-shot

MODE 2 : Rate generator

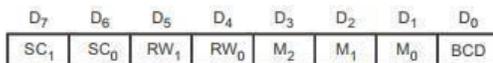
MODE 3 : Square Wave Rate Generator

MODE 4 : Software Triggered Strobe.

MODE 5 : Hardware triggered strobe (Retrigger able).

8. Give the control word format of 8253 Timer.

(May/June-2012)



SC - Select counter

SC₁ SC₀

0	0	Select counter 0
0	1	Select counter 1
1	0	Select counter 2
1	1	Illegal for 8253 Read -Back command for 8254 (See Read operations)

M - Mode

M₂ M₁ M₀

0	0	0	Mode 0
0	0	1	Mode 1
x	1	0	Mode 2
x	1	1	Mode 3
1	0	0	Mode 4
1	0	1	Mode 5

RW - Read /Write

RW₁ RW₀

0	0	Counter latch command (See Read operations)
0	1	Read / Write least significant byte only
1	0	Read / Write most significant byte only
1	1	Read / write least significant byte first, then most significant byte

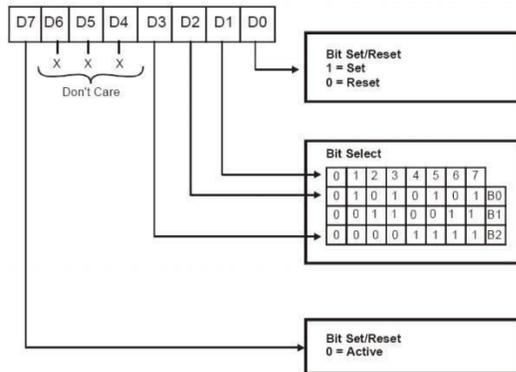
BCD :

0	Binary counter 16 - bits
1	Binary coded decimal (BCD) Counter (4 Decades)

Note : Don't care bits (x) should be 0 to ensure compatibility with future Intel products

9. What is BSR mode in 8255?

(Nov/Dec-2012)



10. What are the different peripheral interfacing used with 8085 microprocessor?
(May/June-2013)

Keyboard, Memory, EPROM, LCD display, LED seven segment displays.

11. What are the output terminals in USART 8251? (May/June-2013)

TXD (output terminal), TXRDY (output terminal), TXEMPTY (Output terminal), RXRDY (Output terminal), DTR (Output terminal), RTS (Output terminal)

12. What are the different types of command words used in 8259A? (Nov/Dec-2013)

The command words of 8259A are classified in two groups

1. Initialization command words (ICWs)
2. Operation command words (OCWs)

13. What are the basic modes of operation of 8255? (Nov/Dec-2013)

Mode 0: Basic Input/output

Mode 1: Strobes Input/output

Mode 2: Bi-direction bus.

14. How data is transmitted in synchronous serial communication?
(May/June-2014)

In this the data is transferred bit by bit that is used for one to one communication.

15. What is a control word?

It is a word stored in a register (control register) used to control the operation of a program digital device.

16. What are the features used in mode1 of 8255?

Two groups – group A and group B are available for strobe data transfer.
Each group contains one 8-bit data I/O port and one 4-bit control/data port.
The 8-bit data port can be either used as input or output port. The inputs and outputs both are latched.
Out of 8-bit port C, PC0-PC2 are used to generate control signals for port B and PC3=PC5 are used to generate control signals for port A. The lines PC6, PC7 may be used as independent data lines.

17. What is the use of 8251 chip?

8251 chip is mainly used as the asynchronous serial interface between the processor and the external equipment.

18. What are the modes of operations used in 8253?

Each of the three counters of 8253 can be operated in one of the following six modes of operation.

Mode 0 (Interrupt on terminal count) Mode 1 (Programmable mono shot) Mode 2 (Rate generator)
Mode 3 (Square wave generator) Mode 4 (Software triggered strobe) Mode 5 (Hardware triggered strobe)

19. Give different types of command words used in 8259A?

The command words of 8259A are classified in two groups
Initialization command words (ICWs)
Operation command words (OCWs)

20. What are the o/p modes used in 8279?

8279 provides two output modes for selecting the display options.

PART-B

1. Explain how the 8255A programmable peripheral interface chip can be used with the 8085 for reading and writing parallel data from and to I/O devices. **(16)**
2. Explain the architecture, functions and registers of the 8255 PPI. **(8)**
3. Describe how programmable timer is interfaced with 8085. **(8)**
4. Explain the internal architecture and programming of 8259 Programmable Interrupt Controller. **(16)**
5. Discuss how a PIC, 8259 is interfaced to an 8085 based system. How does 8259 service an interrupt? **(16)**
6. Discuss the various modes of operation of the programmable interval timer, 8254 **(8)**
7. Illustrate briefly the block diagram of 8254 timer. **(8)**
8. Describe with neat sketch about block diagram and function of 8237. **(16)**
9. With neat functional block diagram describe the functions of 8251 USART. **(8)**
10. Demonstrate how the serial data transfer can be performed using 8251 USART. **(8)**
11. With a neat diagram Discuss briefly about the internal architecture and registers of 8279 keyboard/ display controller. **(8)**
12. Describe how keyboard and Display controller is interfaced to 8085. **(8)**
13. Interface an 8 bit ADC with 8085 microprocessor and write the algorithm and assembly language program to get 500 digital equivalent data of analog samples taken at every one millisecond and store them in memory. Make suitable assumptions. **(16)**
14. Explain with neat sketch, the A/D converter interfacing with 8085 microprocessor. **(8)**
15. Explain the interfacing of D/A converter with 8085 microprocessor. **(8)**
16. Describe with neat sketch, the A/D converter interfacing with 8051. **(8)**
17. Explain the interfacing of D/A converter with 8051 microcontroller with neat diagram. **(8)**
18. Describe how keyboard and display controller is interfaced to 8051. **(16)**
19. Illustrate the operation of 8255 PPI Port A programmed as input and output in mode 1 with necessary handshaking signals. **(8)**
20. Illustrate the features of DMA controller. **(8)**

UNIT V
MICRO CONTROLLER PROGRAMMING & PPLICATIONS
PART -A

1. What are the applications of 8051 Microcontroller? (M/J '12')

(i) Washing Machine control, (ii) Traffic Light control, (iii) Servo Motor control, (iv) Stepper motor control, (v) DC motor control.

2.What are the 3 classes of data transfer instructions?

- General purpose transfer
- Accumulator specific transfer
- Address object transfer

3. What are the 3 classes of control transfer instruction?

- Unconditional calls, returns and jumps
- Conditional jumps
- Interrupts

4. Write about CALL statement in 8051?(Nov/Dec 2012)

There are two subroutine CALL instructions. They are

*LCALL(Long CALL)

*ACALL(Absolute CALL)

Each increments the pc to the 1st byte of the instruction & pushes them in to the stack.

5.Write about the jump statement?

There are three forms of jump. They are

LJMP(Long-jump)-address 16

AJMP(Absolute jump)-address 11

SJMP(short jump)-relative address

6.Write a program to find 2's complement using 8051?

MOV A,R0

CPL A

INC A

7. Write a program to swap two numbers using 8051?

```
MOV A,# data  
SWAP A
```

8. Mention the interrupts of 8051 microcontroller? (Nov/Dec '13')

INT0, TF0, INT1, TF1, R1 & T1

9. What is a stepper motor?(Nov/Dec 2014)

A stepper motor is a specially constructed DC motor with 4 windings. It rotates in precise steps it a common step size range of 0.9 to 30 degrees.

10. Write the coil sequence for a full step rotation of a stepper motor.(May/June 2013)

Clockwise	B2	B1	A2	A1	Anti clockwise
↓	D3	D2	D1	D0	↑
	1	0	0	1	
	0	0	1	1	
	0	1	1	0	
	1	1	0	0	

11. What are the tasks involved in keyboard interfacing?

The task involved in keyboard interfacing are

- Sensing a keyboard
- Sensing a key actuation
- De bouncing the key and
- Generating key codes .

12. How a keyboard matrix is formed in keyboard interface ?

The return lines RL0 to RL7 of 8279 are used to form the columns of keyboard matrix and decoded scan the scan lines SLO to SL3 of 8279 are used to form the rows of keyboard matrix. In encoded scan mode, the output li es of external decoder are used as rows of keyboard matrix.

13. What is scanning in keyboard and what is scan time?

The process of sending a z or to each row of a keyboard matrix and reading the columns for key actuation is called scanning. The scan time is the time taken by the processor to scan all the rows one by one starting from first row and coming back to the first row.

14. Why a driver circuit is used while connecting a microprocessor to relay?

Microcontroller pin lacks sufficient current to drive the relay. So a driver circuit or power transistor is placed between the microcontroller and the relay.

15. How the speed of an electric motor is controlled?

The speed of an electric motor is controlled by controlling the power source of the motor. To provide a variable power supply, a variable series resistance is placed between the motor and supply.

16. What is the use of GATE bit in TMOD register of 8051 MC?

Timers are started and stopped when GATE bit of TMOD is zero

17. Define key scanning.

If all the rows are grounded and any one key is pressed in the matrix keyboard, corresponding key column will be zero, since once the key is pressed, it provides the path to ground. This process is called as key scanning.

18. Explain the 16-bit register SP of 8051.

SP stands for stack pointer. SP is a 8- bit wide register. It is I incremented before data is stored during PUSH and CALL instructions. The stack array can reside anywhere in on-chip RAM. The stack pointer is initialized to 07H after a reset. This causes the stack to begin at location 08H.

19. Write a program using 8051 assembly language to change the data 55H stored in the lower byte of the data pointer register to AAH using rotate instruction.

```
MOV DPL,#55H
MOV A,
DPL RL A
Label :SJMP label
```

20. Write a program to subtract the contents of R1 of Bank0 from the contents of R0 of Bank using 8051.

```
MOV PSW,#10
```

```
MOV A,R0 MOV
PSW,#00 SUBB A
```

21. Write a program to mask the 0th bit using 8051?

```
MOV A,# data
ANL A,#81
MOV DPTR,#4500
MOVX @DPTR,A
LOOP: SJMP LOOP
```

22. What are the different groups of instructions supported by 8051?

Data transfer group, Arithmetic group, Logical group, Branching group and Bit manipulation group.

23. Write a program to mask the 0th bit using 8051?

```
MOV A,# data
ANL A,#81
MOV DPTR,#4500
MOVX @DPTR,A
LOOP: SJMP LOOP
```

PART –B

1. Explain the function of 8051 microcontroller instructions for performing arithmetic and logical operations with suitable example. **(16)**
2. Explain with neat diagram the closed loop control of servo motor using microcontroller. **(16)**
3. Tabulate the program control instructions of 8051 and explain any five of them **(8)**
4. Code a program to rotate stepper motor continuously using 8051. **(8)**
5. Explain the different types of instructions set used in 8051 microcontroller. **(8)**
6. Explain the following 8051 instructions with example. **(8)**
 - i. DA, MUL, SWAP, SJMP.
7. Write a 8051 ALP to copy 10 bytes of data stored from location 30H to another location starting from 50H. **(8)**
8. Explain an assembly language program based on 8051 microcontroller instruction set to perform four arithmetic operations on two 8 bit data. **(8)**

9. Explain in detail the different methods of memory address decoding in 8051 (8)
10. Write a program to add two 16 bit numbers. The numbers are 8C8D and 8D8C. Place the sum in R7 and R6. R6 should have the lower byte. (16)
11. Demonstrate with a neat diagram, a 4x4 keyboard interfacing with 8051 microcontroller.
12. Discuss how to program and interface LCD to an 8051. (16)
13. With neat diagram, Illustrate the interfacing of Keyboard and display device with 8051 Microcontroller. (8)
14. Describe in detail about the microcontroller application in a closed loop control of servo motor. (8)
15. Describe how does one control a stepper motor via opto isolator? Explain it with a neat diagram (8)
16. Assume that P1 is an input port connected to a temperature sensor. Write a program to read the temperature and test it for the value 75. According to the test (8)